

Music and Music of the Spheres:

A re-interpretation of 'Music of the Spheres' in the 20/21st century.

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Music and astronomy have been linked for more than 2,500 years. From the founding fathers of Pythagoras, Plato and Kepler, the philosophy of the 'Music of the Spheres', is far from a dead science. With the latest advancement of the merging of the sciences and arts, a new enthusiasm is bringing this ancient cosmology in-line with current scientific laws and experimental fields. From the sound of black holes, to wave phenomena, it is now accepted by influential thinkers that sound could have helped form the universe. Therefore the 'Music of Spheres' which postulated harmonious relationships among the planets, may now be seen a different light.

This essay is going to give an overview of the history of the science of the 'Music of the Spheres'. It will then examine the current advances in science, applying the findings to our understanding of the 'Music of the Spheres'. It is the belief of the writer that this ancient science of the 'Music of the Spheres'; developed by Greek and Pre-Greek Philosophers, has gone through a valid update and re-synthesis. This ancient science which spans over 2,500 years or more, can now be seen in relationship to new found ideas, that expand upon original concepts.

"The chief aim of all investigations of the external world
should be to discover the rational order and harmony
which has been imposed on it by God and
which He revealed to us in the language of mathematics."
— Johannes Kepler (1571-1630)¹

"As Above So Below"
— Hermes Trismegistus ²

¹ Pakhomov, V.L. "Precession of the Planets or What was Plato Writing About?" *The Precession Law of the Planets – Part Two*. http://www.pakhomov.com/plato_2.html (10th June 2005).

² Janet K. Turner. "On the Emerald Tablet of Hermes." *Alchemy Journal Vol. 3 No.4 Autumn 2002*. <http://www.alchemylab.com/AJ3-4.htm> (19th June 2005).

The ancient Greek philosophers were also astronomers and mathematicians. They in all their wisdom and intellectual teachings attempted to show how nature and music are interconnected.³ This theory wasn't solely developed by the Greek Philosophy schools rather, it is hinted at in ancient teachings of the pre-Greek era, dating back to ancient Babylonians and Egyptians. It must not come as a surprise that Pythagoras and Plato used natural laws of the octave and harmonics to develop the western musical system. Pythagoras who through his studies of intervals and scales using stringed instruments first realised that mathematical reasoning of music could be applied to nature. Therefore the attempt to unify the laws of nature with statistical calculations of music ratios has been shown to have very interesting interconnections from the merging the sciences with the arts. This initial development brought about the 'Music of the Spheres', which the Grove dictionary describable as:

"A Pythagorean doctrine postulating harmonious relationships among the planets governed by their proportionate speeds of revolution and by their fixed distance from the earth."⁴

It was Pythagoras of Samos in (582-500 BCE) that discovered the mathematical nature of the musical scale and the relationship between music and number.⁵ It was from the basis of analogies between musical consonances, from his findings of the musical proportions on strings that there was found a definite connection with natural phenomena. It is accepted as common knowledge today that musical ratios and nature's laws, fit side by side. But it may be hard to accept that a man made musical scale may represent cosmic oscillations and rotations. If we are to understand where Pythagoras's thinking centered, it must be considered that he postulated there were three kinds of music: *Musica Instrumentalis* – practical; *Musica Humana* – the harmony of the body; *Musica Mundana* – created by the heavens which at that time, the universe was considered earth-centered.⁶ All three kinds of music interacted with one another, causing many different circumstances. Kepler who used music theory based on Pythagoras' original work, had similar ideas. In advancing Pythagoras's theories, Kepler tried to relate the positions of the planets to musical ratios. At the same time trying understand why the planetary orbits were so and how they interconnected. The five Platonic solids played a very important role for Kepler, in his masterpiece 'harmous

³ Jamie James. "Music of the spheres: Music, science, and the natural order of the universe." (London: Abacus/Little, Brown Co. 1993), 262.

⁴ James Haar. 'Music of the spheres', *Grove Music Online* ed. L. Macy (10th June 2005), <http://www.grovemusic.com>

⁵ Barbera, Andre. 'Pythagoras', *Grove Music Online* ed. L. Macy (10th June 2005), <http://www.grovemusic.com>

⁶ John Pickard. "The Search For The Music Of The Spheres." *Proceedings of the BRLSI* Volume 8. 2004. <http://www.brlsi.org/proceed04/astronomy200311a.htm>. (10 June 2005)

munide' he drew complex pictures and detailed how he considered the planetary orbits to be constrained, by these solids. ⁷These platonic solids were originally postulated by Plato and were assumed to be the inherent structure of the universe. What was unique about these solids is that they were able to express the harmony of the spheres, in geometric form. In the article 'New Themes And Audiences For the Physics of Music', Gibson and Johnston sum up Kepler's work, as follows:

"Kepler didn't express the law, as we do today, as a relationship between the average radius of a planet's orbit and its period. Instead he presented the orbital angular velocity for each planet on a musical staff, the lowest note corresponding to the aphelion and the highest to the perihelion. The ratios of these angular-velocity pairs are very close to those defining musical intervals, and their corresponding notes could be arranged into four harmonious chords".⁸

Concerning this topic Kepler himself wrote:

"The heavenly motions are nothing but a continuous song for several voices, to be perceived by the intellect, not by the ear; a music which, through discordant tensions, through syncopations and cadenzas as it were, progresses towards certain predesigned six-voiced cadences, and thereby sets landmarks in the immeasurable flow of time".⁹

Kepler states quite clearly that the music must be perceived by the intellect not by the ear. He used music examples to explain the vast symphony the cosmos plays, which is beyond the hearing range. After Kepler came the 16th century English scientist, Robert Fludd and his extension of the, 'The Divine monochord' theory; which was in basic form conceived by Pythagoras.¹⁰ This consisted of one string along an instrument, consisted of all the planets, where a certain sound or pitch was associated with each planet. He postulated that the soul or spirit of the world was played by the universe which was a musical instrument. His theory aimed to express the harmony between the heavenly spheres and man. He commonly found error with Kepler's work, and it was with the final development of the 'Divine Monochord' theory, that the original concepts of the 'Music of the Spheres' temporarily ended. It was commonly accepted by the ancient Greeks that the 'Music of the Spheres' proved that God does indeed

⁷ Susi Jeans and, H.F. Cohen. 'Kepler [Keppler], Johannes', *Grove Music Online* ed. L. Macy (10th June 2005), <http://www.grovemusic.com>

⁸ George N Gibson. and Ian D. Johnston. " New Themes And Audiences For The Physics Of Music." *Physics Today*. 55.1 (2002): 42-49
<http://search.epnet.com.proxy.library.adelaide.edu.au/login.aspx?direct=true&db=afh&an=5774764>

⁹ see footnote number 5

¹⁰ Cecil Adkins. 'Monochord', *Grove Music Online* ed. L. Macy (10th June 2005), <http://www.grovemusic.com>

exist. This was accepted due to the so called perfect musical ratio mapping with the cosmic objects, thus expressing beauty of a Divine Order. It is not until now in the 20/21st century that there has been a re-visitation and re-valuation from a scientific viewpoint.

There have been many composers since the ancient Greek philosophers. Some have taken the idea of the 'Music of the Spheres' to a literal level, and others have tried to represent the music from purely artistic viewpoint. It could always be debated, which system is considered more authentic, when in the world of art, musician's expression of their levels of understanding could sprout from many different systems of complex diversity. One example is the composer Gustav Holst. His composition called 'The Planets', which aimed to express the vastness of the music of the spheres through music, was conceived as early as 1913.¹¹ All the planets Mars, Saturn, Venus, Jupiter, Mercury, Uranus, and Neptune, were represented. Holst composed through the emotional, intuitive side. His work came about from an astrological and mythology point of view, which is why earth was not included. We have also another example of an intuitive approach to this in John Cage who in 1961 superposed the musical notation of his *AtlasEclipticalis* on star charts.¹² Also in the final piece from George Crumb's *Makrokosmos I*, written in 1972 was notated in the shape of a spiral galaxy.¹³ There is one contemporary composer who has taken a different approach Dr. Terenzi, who studied opera and musical composition at Conservatory G. Verdi. Then went on to teach mathematics and physics at the Liceo Scientifico in Milan. Here is what space.com writes about Terenzi's music called Sonic Astronomy:

"It was at the Computer Audio Research Laboratory at the University of California, San Diego, that she first applied sound synthesis language to astronomical data to devise the technique she calls "acoustic astronomy." ¹⁴

Terenzi's process was to take astronomical data and covert it into human hearing range. One of her main compositions was from galaxy UGC 6697, which was converted from radio frequency into the human hearing range. Based on similar ratio transpositions for the first time, people could hear actually what these galaxies might sound like. Coming from the research at the Computer Audio Research Laboratory at the University of California San Diego, it was claimed to have had mesmerized listeners across planet earth.

¹¹ Colin Matthews. 'The Planets', *Gustav Holst*. *Grove Music Online* ed. L. Macy (10th June 2005), <http://www.grovemusic.com>

¹² Bryan Trussler. "Gustav Holst: The Planets Suite." <http://www.aquarianage.org/lore/holst.html> (10th June 2005).

¹³ see footnote 4

¹⁴ Matt Howarth. "Fiorella Terenzi: Stellar Icon." *Space Sounds*. 23 December 1999. http://www.space.com/sciencefiction/terenzi_profile_991223.html (10th June 2005).

In more recent time, there has been more evidence of galaxies and other cosmic object emitting sounds. One instance recently was the detection of sound waves coming from a super massive black hole in the Perseus cluster. This cluster was observed using NASA's Chandra X-ray observatory and was measured by astronomers to be 250 million light years from earth. One very interesting fact is that the sound waves produced by the Perseus cluster may solve a long-standing problem in astrophysics. Steve Allen, also of the Institute of Astronomy and co-investigator in the research, says:

"The Perseus sound waves are much more than just an interesting form of black hole acoustics. "These sound waves may be the key in figuring out how galaxy clusters, the largest structures in the Universe, grow."¹⁵

Andrew Fabian of the Institute of Astronomy at the University of Cambridge and leader of the study said:

"We have observed the prodigious amounts of light and heat created by black holes, now we have detected the sound. "In musical terms, the pitch of the sound generated by the black hole translates into the note of B flat. At a frequency over a million times deeper than the limits of human hearing, this is the deepest note ever detected from an object in the Universe."¹⁶

It is interesting to note a different viewpoint of the 'Music of the Spheres' as Allen quotes "These sound waves may be the key in figuring out how galaxy clusters, the largest structures in the Universe, grow." In other words sound may be the key to unlocking one of astronomy's mysteries. In musical terms, the pitch of the sound generated by the Perseus black hole translates into the note of B flat or A sharp and is 57 octaves lower than middle-C. It could not possibly be explored at this time, but there is ample evidence to suggest that certain sounds may hold clues to the why the ancients built certain structures around specific frequency patterns. Dr. Uttley explains:

"...the music of a black hole could be called improve. Pressed for some comparison to a specific artist or style, he said the late Greek composer Iannis Xenakis used flicker noise to randomly generate pieces called stochastic music. "You could use the variations in the X-ray output of black holes to produce just this sort of music.," ¹⁷

¹⁵ Unknown. "Music of the spheres." *University of Cambridge*. 10 September 2003. <http://www.admin.cam.ac.uk/news/dp/2003090901> (10th June 2005)

¹⁶ see footnote 13

¹⁷ Dr. Phil Uttley. "Music of the Black Holes: They All Play the Same Tune". *Structure and evolution of the universe: Beyond Einstein, From the Big Bang to Black Holes*. April 2002. <http://universe.nasa.gov/press/2002/020409a.html> (10th June 2005).

There are many other examples of science finding celestial bodies resonate to specific frequencies, here what is unique about our own earth:

“Some scientists say music is ubiquitous in Nature (Earth itself hums a tune) and shows up in the arrangements of the planets, in seascapes, and even in our brainwaves. A few researchers have gone so far as to suggest, without any observational studies done of in-shower singing, that humans are born musical”.¹⁸

This is also the case for music. In the 1970s, music like jazz, classical and other forms was found by researchers to contain flicker noise, which is a mathematical formula found in nature. It is interesting to see that science has started to view the discipline of the ‘Music of the spheres in a different light. They have taken what many researchers say is an out of date philosophy and re-created it or re-applied it, in a way that some would argue was well over due for this ancient art form. Thus what this research seems to be pointing towards is a merger between music and physics, leaving behind the old view points of how the ‘Music of the Spheres’ philosophy should be represented.¹⁹

This merger between music and physics is best expressed as the study of spectroscopy.²⁰ Spectroscopy is to be understood as the study of frequencies and it is the single most important tool in modern physics and precision measurement. Clearly much of the physics of music involves relationships between frequencies and therefore from a scientific standpoint, music is fundamentally spectroscopic. Intervals, scales, overtone series, consonance and dissonance, vibrational modes of instruments, and timbre all provide rich material for introducing spectroscopy and its significance. Moreover understanding musical relationships gives a general understanding of how spectroscopy applies to many other fields of physics and beyond. It must be borne in mind, though, that the connection between physics and music goes beyond spectroscopy. In that there may be different levels of experience which can never be expressed in common physics.

One such researcher who has taken this theory to the next level was Hans Jenny who was a Swiss scientist. He developed the science of wave phenomena or cymatics to complex levels. His work followed on from Ernst Chladni, a German physicist and acoustician. Chladni created complex sand patterns by vibrating a

¹⁸ Robert Britt. “ Source of Earth's Hum Revealed, Space Symphony Possible.” *Space.com*. 26 March 2000. http://www.space.com/scienceastronomy/planetearth/space_symphony_000323.html (10th June 2005).

¹⁹ Robert Britt. “The Music of Black Holes Pt2.” *Space.com*. 09 April 2002. http://www.space.com/scienceastronomy/astronomy/blackhole_music_020409-2.html (10th June 2005).

²⁰ See footnote 6

steel plate with a violin bow. Jenny furthered this research which he began in the 1950s, by using a sine wave generator to vibrate various powders, liquids and oils. These disturbances in the liquids and other mediums created what acousticians call standing wave patterns; which are vibrations that resonate together. The standing waves started to form complex geometries which Jenny found mirror what is found in nature. As Jenny increased the complexity of the frequency oscillators the resulting patterns became more intricate. These ranged from the macrocosmic to the microcosmic, showing the pattern of galaxies to the geometry of the snow flake.²¹ Cymatics which is the study of wave phenomena within mediums of liquids to solids, proved how sound could shape matter. Jenny showed undoubtedly that sound can effect matter and even shape it into common geometries that the universe is made up of. The 'Music of the Spheres' then within Jenny's work takes on a literal interpretation, which parallels ancient cultures from all around the world who believed sound and music held certain magical powers capable of affecting us in a variety of ways. Jenny himself as a musician and scientist decided to do an experiment using the ancient Sanskrit chants. In this tradition the Sanskrit mystics believed that the Yantra; which is a picture or geometric form, is the same as Mantra; a sound or sacred name of a deity or God. Jenny knew from his work that certain vowel patterns created perfect geometry, which is reflected in the inner working of nature. He took a very important Mantra of the Sanskrit tradition, the Mantra 'Om' ; which means the universal sound from the Vedas or the sound which pervades all of creation. Then when he chanted this mantra at a certain specific frequency range, as instructed to do so, a geometric form of the Sri Yantra began to form. Jenny had found a direction connection between sound and perfect form.²² It struck Jenny as revolutionary that these ancient cultures knew an advanced form of wave-physics. Jenny knew now that sound did indeed in some way shape the universe in its conception.²³ Of course a complex interplay of factors would have to be present. For the fact that perfect structure came out of this experiment, confirmed that the ancients had a vast cosmology, not once thought possible. As scientists are now starting to speculate that the cosmic background hum may be a fundamental frequency which could be associated with the so called event of the big bang. Pythagoras and Plato may not have been too far off when they say that sound could effect us, in some form. Jenny in this work on Cymatics certainly showed that certain sounds, form shapes that are present throughout all creation.

²¹ Jeff Volk. "Sounds Insights". 2001. <http://www.cymaticsource.com/KindredArticle.pdf> (10th June 2005).

²² Unknown. "About Sound and Form." *Bindu periodical on Yoga Tantra Meditation no.10*. <http://www.scand-yoga.org/english/bindu/bindu10/about-sound-and-form.html> (19th June 2005)

²³ Hans Jenny. *Cymatics - A Study of Wave Phenomena and Vibration*. Revised. Jeff Volk. (Hong Kong : MACROmedia, 2001).

In confirmation of Jenny's work, researchers produced similar results in the Great pyramid of Giza. The Giza pyramid is well known for its advanced acoustics. Researchers in the Great pyramid of Giza, in research connected with Cymatics, chanted specific Egyptian sacred names, while using a layer of sand on a cover over the Kings Cover; a granite coffin like structure . This chanting caused complex geometries and even hieroglyphics to appear in the sand on the covering. Through these complex acoustics, built into the Great Pyramid it was possible to get sound to form complex patterns.²⁴ More research so course need to be conducted, but could the ancient Egyptians have known the important of sound and its connection to visual forms? This begs the questions if sound can shape matter, could sound affect us as electromagnetic beings.

What we are seeing is a re-activation of the idea of music of the spheres. No longer is science trapped within the limitations of frequencies and musical ratios, attempting to explain the mysteries of the planets in our solar system. Arnold Sommerfeld; a German physicist whose atomic model permitted the explanation of fine-structure spectral forms, says there is a connection between science and music of the spheres, asks:

"Would Kepler, the mystic who, like Pythagoras and Plato, tried to find and to enjoy the harmonies of the cosmos, would he have been surprised that atomic physics had rediscovered the very same harmonies in the building-stones of matter, and this in even purer form? For the integral numbers in the original quantum theory display a greater harmonic consonance than even the stars in the Pythagorean music of the spheres."²⁵

From the atomic to the subatomic, science has found that everything is in the state of vibration. Everything vibrates at some level, from the Electromagnetic to the acoustic.²⁶ These vibrations may or may not be within our hearing range. As Sommerfeld states, science is now finding modern physics connection to the 'Music of the Spheres' in its truest meaning of the term. A purest would say that the 'Music of the Spheres' term should only be used in the original context. It has been argued that this viewpoint may not be exactly the truth. It is now common knowledge that Plato and Pythagoras in their respective texts explained how they learned many mysteries from the ancient Egyptians. Therefore do we need to trace the science of the 'Music of the Spheres' back further in time? It would seem the logical thing to do. They did indeed travel to this locations and trade

²⁴ John Reid. "Sonic Technology of the Pyramid Builders."
<http://www.andrewcollins.com/page/conference/speakers/JR04.htm> (19th June 2005)

²⁵ see footnote 7.

²⁶ Unknown. "Symmetry and "Magic" Numbers or From the Pythagoreans to Eugene Wigner."
Proceedings of the Wigner Centennial Conference Paper No. 14.
<http://quantum.ttk.pte.hu/~wigner/proceedings/papers/w14.pdf> (10th June 2005).

knowledge with these cultures.²⁷ One basic example in support of this theory, without examining the avalanche of material, is that it has been found that the Great Pyramid of Giza; which some consider to be over 4,000 years old, contains precise frequencies of F/F# and A/A#. According to ancient Egyptian texts these frequencies were the harmonics of our planet.²⁸ Does this suggest the ancient Egyptians knew a much more advanced mathematics and physics, than taught by our traditional science? Maybe the Greek Philosophers just received the tip of the iceberg in acquiring information from these cultures. It can be now accepted that the science of the 'Music of the Spheres', is dated to pre-Greek era as now found by Astronomers, musicians and current day researchers.

Pythagoras, Plato and Kepler all believed that the 'Music of the Spheres' was real. Of course many Musicologists have found that these Greek Thinkers were only half way there. Their theorems do not fit the current research that has been conducted. What science is now finding through wave-phenomena and spectroscopy that the ancient Greek and pre-Greek thinkers may have been onto something vast in scope. From Black Holes to sound recordings of galaxies, the scientific and musical advancement since the 1950s has taken a quantum leap. We are beginning to hear the 'Music of the Spheres' as it was intended originally. What needs to be explored is the ancient viewpoint of the music of the spheres, from which the Greek Philosophers may have received their wisdom teachings from different ancient cultures. Thus in pushing back the dating of the 'Music of the Spheres' Philosophy, it may allow for the cross synthesis to occur with current day research. If sound and form are seen to have a intimate connection maybe a new interest needs to be kindled, to look for deeper answers. As science and musicology advances in the 21st century, once held historicised mythological concepts for thousands of years old may once again be understood in a different light. One thing is for sure that sound from distant galaxies in helping astronomers and other scientists to unlock the mysteries of the universe.

²⁷ Garth Kemerlin. "Plato (427-347 BCE)." 7 August 2002.
<http://www.philosophypages.com/ph/plat.htm> (10th June 2005).

²⁸ J J Hurtak and Pat Bailey. "Music, Acoustics and Scientific Measurement in the Great Pyramid of Egypt". *Future History*. 2.7 (Spring 1998).

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